

STATEMENT OF BASIS

PERMITTEE: The United States Department of Interior, National Park Service

FACILITY: Mesa Verde National Park Water Treatment Plant

PERMIT NO: CO-0034622

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PERMIT TYPE: Federal Facility, Minor Industrial, Permit Renewal

Background Information

This statement of basis is for the renewal of the permit for the discharge from the water treatment plant (WTP) at Mesa Verde National Park (Park) in Montezuma County, Colorado. The WTP is owned and operated by the National Park Service and is located approximately 1/10 of a mile south of U.S. Highway 160 near the main entrance to the Park, and approximately 7 miles east of the City of Cortez, Colorado. The WTP serves the Park visitors services, campground, and several residences with potable water. Peak water demands occur during the summer and the lowest water demands occur during the winter. There is about 4 million gallons of storage capacity for drinking water in the Park. Water is diverted from the West (Fork) Mancos River and is conveyed about 18 miles to the Park via a pipeline. An alternative water source is Jackson Gulch Reservoir, which diverts water from the West Mancos River. The pipeline conveys the water to an underground storage tank, which is located under a parking area located adjacent to the Main Entrance Road and about ½ mile south of the Park entrance. From the underground storage tank, the intake water goes by gravity flow to the WTP via another pipeline.

At times, especially during the winter, there may be a bypass of intake water at the intake water storage basin. In order to keep the long pipeline from freezing during cold weather, a minimum flow (e.g., 10 – 15 gpm) is kept through the pipeline. When the raw water storage tank is full, it is necessary to bypass the extra flow. This bypassed flow goes to an unnamed tributary to Mud Creek, a tributary to the Mancos River. This bypass has been occurring for approximately 20 years. Since the bypassed water is being returned to the same river basin (i.e. Mancos River basin) and is of the same quality that was diverted from the river, it is not necessary to have an NPDES permit for this bypass. The permit does not address the bypass.

Until recently the WTP used conventional rapid sand filtration technology. The WTP now uses a membrane filtration process to treat the drinking water. The previous permit required that there be no discharge from the WTP. However, with the new treatment process, there will be more wastewater and the need to discharge. The increase in the volume of wastewater is due in large part to the fact that with the new treatment process, filter backwash water normally is not recycled for reuse. There is the possibility that the filter backwash water might be recycled during periods of limited water supply.

There is one membrane filtration unit, a model AP4 Microza Filter from the Pall Corporation. The sediment content of the raw water is very low and there is no pretreatment of the water prior to the membrane filtration unit. The water treatment process consists of membrane filtration and chlorination. The membrane filtration unit has a maximum capacity of about 350 gallons per minute (gpm), but is normally operated at about 130 to 180 gallons gpm in order to not have to frequently start and stop operation. Currently about 24 million gallons of filtered water are produced annually. During the summer about 180,000 to 225,000 gallons are produced daily. Because of the storage capacity for drinking water, at times during the winter, when the demand for water is low, the WTP may not be operated for several consecutive days.

There are three sources of process wastewater flow in the facility: (1) routine backwashing of the membrane filters (process stream flux maintenance (FM)), (2) the enhanced flux maintenance (EFM) cycle, and (3) a clean in place (CIP) cycle. There is no discharge of sanitary wastewater from the WTP.

The largest volume of wastewater comes from the routine FM cycle (i.e., backwashing of the membrane filters). Raw water is used to flush solids from the filter. The permittee estimates the average FM flow is about 275 gallons/hour of operation. For a full 24 hours of operation there would be about 6,600 gallons of FM flow. During the winter months the volume of FM flow would be much less. Assuming an annual production of 24 million gallons of water and 275 gallons of FM wastewater per hour of operation, the annual volume of FM wastewater produce could range from about 600,000 gallons at an operating rate of 180 gpm to about 850,000 gallons at an operating rate of 130 gpm. Since there is no chemical addition prior to the water going to the membrane filters, the FM wastewater contains only the raw water colloidal matter rejected by the membrane units and the minerals dissolved in the raw water supply.

This wastewater is directed to either of two rectangular sludge decant/settling basins (settling basins) located below the floor of the WTP. It is this writer's understanding that the surface area of each basin is 26' by 20' and they are 10' deep. There is an overflow pipe located 1 foot below the top of each basin. Any overflow from the settling basins would go to Outfall 001. Water can also be pumped from the settling basin to Outfall 001 or pumped to the one outside basins located approximately 50' to the west of the WTP building.

These outside basins are concrete vaults, each measuring approximately 20' by 40' by 10' deep. With the previous water treatment system (i.e., conventional filtration), the filter backwash water was pumped to one of these outside basins and the solids were allowed to settle. There is a sliding gate at the east end of each basin that can be lowered for decanting water from the top part of the water column. Before the addition of the membrane filtration unit, water would be

decanted from a basin and returned to the WTP as part of the water supply. Now that this water is not recycled back to the WTP, the piping is being modified to allow the water to be routed to Outfall 001 for discharge. At the west end of the outside basins there is piping that can be used to release water to Outfall 002. The intake end of the west end piping is located about two feet above the bottom of the basin. At this time it is not known if there is one valve or two valves (i.e. a valve for each basin) that control the release of water from the west end of the outside basins. Until it is shown that there is a west end valve for each basin, it will be assumed that there is only one valve controlling the release of water from both basins at the west end. Assuming that the bottom two feet of each basin is for the accumulation of sediment and that there is one foot of freeboard, the maximum operating capacity of each outside basin is approximately 42,000 gallons. The removal of sediment from the outside basins is done periodically as needed. A basin is allowed to dry out and the sediment removed manually.

The enhanced flux maintenance (EFM) cycle is performed after approximately 1 million gallons of water has been processed. (Note: the term “enhanced flux maintenance” is used by the Pall Corporation, the manufacturer of the membrane filter unit, to describe a patent pending process to keep the membranes free of fouling materials. The chemicals used are selected based on the foulants that may be present at the specific facility.) It is this writer’s understanding that at the Mesa Verde WTP the EFM cycle consists of using heated filtered water with a low concentration of sodium hypochlorite to remove biological films from the surface of the membranes. After the chemical solution is applied, there is a rinse step and flushing of the system. Approximately 350 gallons of wastewater are generated from the EFM cycle at the Mesa Verde WTP. According to the WTP operator, the residual concentration of chlorine in the EFM wastewater is very low (e.g., less than 1 mg/L). This wastewater can be either routed to one of the settling basins in the WTP or pumped to one of the outside basins.

A clean in place (CIP) cycle is performed 1-2 times per year as needed to remove accumulated foulants that are not removed by backwashing and the EFM cycle. The CIP cycle takes about 24 hours to complete and involves three steps; an acid wash, a caustic wash, and a rinse. The acid wash involves 350 gallons of warm 2% citric acid solution. The caustic wash step uses about 350 gallons of warm 0.5% NaOH and 300 mg/L NaOCl solution. The rinse step uses unheated filtered water. The wastewater is pumped to one of the outside basins. It is this writer’s understanding that after the wastewaters from the three steps are mixed together, the resulting pH is about neutral (i.e., 6.9) and the chlorine concentration is very low.

According to the permittee, the raw water supply has a very low concentration of suspended material. As a result, there usually is not much accumulated sediment in the settling basins. Sediment is removed from the settling basins 1-2 times per year. It is this writer’s understanding that the procedure for cleaning a settling basin is to use a portable pump to pump the bottom 2 feet of water from the settling basin to one of the two outside basins. Squeegees are used to push the sediment over to the intake of the portable pump and the remaining water and sediment is pumped to one of the outside basins.

The method of operation of the settling basins is to route the wastewater from the FM and EFM cycles to one settling basin until it is near the overflow level, then route these wastewaters to the other settling basin. The water in the full settling basin can then either (1) be pumped to

one of the outside basins or (2) pumped down to the 2 foot level, with the water going to Outfall 001. When the water is pumped to Outfall 001, there would be about 7 feet of drawdown, which is equal to about 27,200 gallons per discharge.

Under the previous permit Outfall 001 was for emergency discharges only. Under this permit renewal it will be used for routine discharges. It consists of about 80 feet of a six inch pipe lying on the ground with no outlet structure. There is not a flow measuring devices installed on the discharge pipe. It is located near the east corner (right back corner) of the WTP property. The coordinates of Outfall 001 are approximately latitude 37° 20' 26" N and longitude 108° 24' 47" W (based on using Google Earth). (NOTE: In amending its permit application, the permittee gave the latitude as 37.340° N and 108.413° W. When converted to degrees, minutes, seconds format, those values are 37° 20' 24" N and 108° 24' 46.8" W, respectively. The apparent reason for the difference of two seconds in the two latitude values appears to be the result of rounding. When 37° 20' 26" N is converted to decimal format, the value is 37.34055556. One second in decimal format is equal to 0.000277777°. Two seconds is 0.000555555°. In a north – south direction, one second is approximately 102 feet on the surface of the earth. This assumes that the earth is a perfect sphere with a radius of 4,000 miles.)

Outfall 002 is located near the north corner of the outside basins. A valve is used to control the flow from the west end of outside basin. The flow would go to a 6" pipe, with no outlet structure and no flow measuring device. According to the permittee the coordinates of Outfall 002 are latitude 37° 20' 27.15" N and longitude 108° 24' 48.96" W.

Receiving Waters

The discharges from Outfalls 001 and 002 would flow overland to the northwest and ultimately go into an unnamed ephemeral drainageway that is tributary to McElmo Creek.

The permittee had planned on discharging from a new outfall that goes to an unnamed tributary of Mud Creek in the Mancos River drainage. However, the outstanding waters (OW) designation of all tributaries to the Mancos River located in Mesa Verde National Park prohibits the new discharge of pollutants to those tributaries. The State of Colorado would have had to deny certification of a permit that would have authorized a new discharge to that tributary of the Mancos River.

Use Classifications and Water Quality Standards

The unnamed tributary of McElmo Creek has been classified by the State of Colorado for Aquatic Life 2, Recreation E, and Agriculture. It has been designated as use protected (UP). The mainstem of McElmo Creek from the source to the northern boundary of Ute Mountain Indian Reservation is classified as Aquatic Life Warm 1, Recreation E, and Agriculture, with no designation. Except during periods of surface runoff, it is doubtful that the discharge would reach the mainstem of McElmo Creek as a surface flow. The classifications for the tributaries of McElmo Creek mean the following:

Recreation Class E: Existing primary contact use;

Aquatic Life Class 2 - Cold and Warm Water Aquatic Life: These are waters that are not capable of sustaining a wide variety of cold or warm water biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species' and,

Agriculture: These waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and which are not hazardous as drinking water for livestock.

The water quality standards of potential concern for the discharge would be chlorine (0.019 mg/L acute toxicity and 0.011 mg/L chronic toxicity) and potentially pH (6.5-9.0). No other pollutants are considered to be of potential concern.

Effluent Limitations

The effluent limitations in the permit are a combination of numerical effluent limitations and operational requirements for the wastewater treatment system. The numerical effluent limitations are given in the table below and are based on a combination of the State of Colorado's Regulation for Effluent Limitations (Regulation No. 62) and effluent limitations considered necessary to comply with applicable water quality standards in the receiving waters. The effluent limitations based on Regulation No. 62 are total suspended solids (TSS) and oil and grease. The effluent limitation on oil and grease is being included because of the potential, although not great, for the spilling of oil and/or grease within the facility and/or leakage from pumps, etc. There will not be an effluent limitation on BOD₅ because the concentration of BOD₅ in this type of discharge normally is very low, usually less than 10 mg/L. The discharges from Outfalls 001 and 002 must each meet the numerical effluent limitations.

Effluent Characteristic	Effluent Limitation		
	30-Day Average <u>a/</u>	7-Day Average <u>a/</u>	Daily Maximum <u>a/</u>
Total Suspended Solids, mg/L	30	45	N/A
Oil and Grease, mg/L	N/A	N/A	10
Total Residual Chlorine, mg/L	0.011 <u>b/</u>	N/A	0.019 <u>b/</u>
The pH of the discharge shall not be less than 6.5 nor greater than 9.0 at any time.			

a/ See Definitions, Part 1.1 for definition of terms.

b/ For the purposes of the permit, the minimum limit of analytical reliability in the analysis for total residual chlorine is considered to be 0.10 mg/L. For purposes of calculating averages and reporting on the Discharge Monitoring Report form, analytical values less than 0.10 mg/L shall be considered zero.

The water quality standard for pH, 6.5 – 9.0, must be met at the point of discharge in accordance with the State of Colorado's Basic Water Quality Standards (Regulation No. 31). This is more stringent than the 6.0 – 9.0 limitation required by Regulation No. 62.

Because most of the time there would be no dilution in the receiving waters, the permit will require that the discharge comply with the water quality standards on total residual chlorine (TRC) at the point of discharge. The effluent limitations on TRC are 0.011 mg/L as a 30-day average and not to exceed 0.019 mg/L in any sample. These limitations are based on the chronic and acute toxicity standards for aquatic life. Because of analytical limitations on monitoring for TRC, the permit will specify that any monitoring value less than 0.10 mg/L will be considered as zero for purposes of permit compliance and reporting purposes. The 0.10 mg/L value is based on using the DPD Spectrophotometric method of analysis and 0.10 mg/L is considered the minimum detection limit for this analytical method. The permit requires that the permittee use an analytical procedure with a minimum detection level no greater than 0.10 mg/L. Although there is the possibility that TRC may be present in the discharge at concentrations of less than 0.10 mg/L but greater than 0.019 mg/L, the TRC most likely would be dissipated by the time the water reached the first classified receiving water, a distance of approximately 1/3 of a mile.

Based on the chemicals being used at the WTP and the quality of the raw water supply, no other water quality based effluent limitations are considered necessary.

The wastewater treatment system at the WTP and the manner in which wastewater can be discharged makes it necessary to include operational requirements in the permit in order to have a reasonable likelihood that the numerical effluent limitations are being consistently met. The operational requirements listed below are being included in the permit as safeguards. If there was a settling pond that provided several days detention time for the wastewater and there was no short circuiting of wastewater through the pond, the operational requirements most likely would not be necessary as effluent limitations.

Operational Requirements for Outfall 001:

1. The wastewater from the clean in place (CIP) process shall be pumped to one of the outside basins before being discharged. The primary reason for this requirement is to minimize the potential for the accidental discharge of wastewater containing high concentrations of total residual chlorine. By routing the CIP wastewater to one of the outside basins there will be greater opportunity for any high concentrations of chlorine to be reduced to an acceptable concentration by means of dilution, chlorine demand, and/or the effects of sunlight.
2. The occurrence of a discharge from Outfall 001 resulting from the overflow of a settling basin(s) shall be minimized to the extent practical. If a discharge from Outfall 001 is to occur as the result of an overflow of a settling basin(s), the discharge shall be terminated as soon as reasonable and practicable. The discharge shall be monitored as required by Part 1.3.2.2. If the discharge exceeds any of the numerical effluent limitations given in Part 1.3.1.1, it shall be reported as required by Part 2.8.2 of the permit; The reason for this requirement is that if wastewater were discharged by

allowing the settling basins to overflow there is a reasonable potential that adequate treatment is not being given to the wastewater. That is, there would be short circuiting of the wastewater to the point of discharge without allowing adequate time for settling of solids and dilution of wastewater containing chlorine in the settling basin.

3. Wastewater is to be discharged on a controlled basis from only one settling basin at a time unless no wastewater is going into either settling basin while the discharge is occurring. Also, there shall be no inflow of wastewater into a settling basin or outside basin while a controlled discharge is occurring from that basin. The reason for this requirement is to insure that when wastewater is flowing into a settling basin or outside basin that there will be time for settling and dilution of any TRC to occur before the wastewater is discharged.
4. The removal of wastewater from a settling basin or outside basin for the purpose of being discharged through Outfall 001 shall be done in such a manner that the wastewater is not removed from the lower two feet of the settling basin or outside basin (i.e. the intake to a pump or an outlet pipe can be no lower than two feet above the bottom of the settling basin or outside basin). The purpose of this requirement is to minimize the potential of getting sediment into the wastewater being discharged.
5. There shall be no controlled discharge of wastewater from a settling basin or outside basin until the wastewater has been analyzed for pH and total residual chlorine and the analytical results show that the effluent limitations for pH and total residual chlorine will be met. The purpose of this requirement is to eliminate having a discharge that would not be in compliance with the effluent limitations on TRC and pH, especially TRC. The analyses are easy to do and can be done quickly.

Operational Requirements for Outfall 002:

1. There shall be a controlled discharge from only one outside basin at a time unless no wastewater is going into either outside basin while the discharge is occurring. Also, there shall be no inflow of wastewater into an outside basin while a controlled discharge is occurring from that outside basin. The reason for this requirement is to insure that when wastewater is flowing into an outside basin that there will be time for settling and dilution of any TRC to occur before the wastewater is discharged.
2. There shall be no controlled discharge of wastewater from an outside basin until the wastewater has been analyzed for pH and total residual chlorine and the analytical results show that the effluent limitations for pH and total residual chlorine will be met. If a discharge will occur from both outside basins at the same time, both basins shall be monitored for total residual chlorine and pH. The purpose of this requirement is to eliminate having a discharge that would not be in compliance with the effluent limitations on TRC and pH, especially TRC. The analyses are easy to do and can be done quickly.

Self-Monitoring Requirements

The self-monitoring requirements for Outfalls 001 and 002 are specified in Part 1.3.2 of the permit. Part 1.3.2.1 has the self-monitoring requirements for those discharges from Outfall 001 that occur without there being an overflow from a settling basin(s). Part 1.3.2.2 has the self-monitoring requirements for those discharges from Outfall 001 that occur when there is an overflow from a settling basin(s). Part 1.3.2.3 has the self-monitoring requirements for discharges from Outfall 002. For each reporting period the self-monitoring results from Parts 1.3.2.1, and 1.3.2.2 are to be combined, summarized, and reported on one discharge monitoring report form (DMR) (e.g., all the monitoring results for TSS for Outfall 001 are to be reported together). The self-monitoring results for Outfall 002 for that period are to be summarized and reported for Outfall 002 on the same DMR.

Parts 1.3.2.1 and 1.3.2.3 require that a composite sample be taken every two weeks for TSS. When the frequency of discharge decreases to less than once every two weeks, the frequency of sampling is to be adjusted accordingly. The composite sample shall consist of a minimum of three (3) grab samples taken near the start of the discharge, at approximately the midpoint of the discharge, and near the end of the discharge. The grab samples shall be composited in equal volumes. A composite sample is being required because of the reasonable potential for a variation in the concentration of TSS while the discharge is occurring.

Although these discharges are relatively small, the permit requires that at least for the first six months the monitoring for total suspended solids is to be done every two weeks if the discharges occur that frequently. The reason for this frequency is to collect sufficient data to determine if the TSS limits can be met consistently. There is a provision in the permit that if after six (6) months of monitoring, all the data shows that the effluent limitations for total suspended solids have been consistently met, the permittee may request the permit issuing authority to change the monitoring frequency for total suspended solids be changed to once every month. This change may be made without going to public notice.

Visual observations are to be done for a visible sheen or floating oil and grease every two weeks. If a visible sheen and/or floating oil or grease are observed, a grab sample is to be promptly taken and analyzed for oil and grease. The approximate total volume of water discharged during the reporting period is to be reported. The volume of water discharged each discharge may be estimated based on the change in the volume of wastewater in the settling basin before the discharge started and after the discharge stopped.

Monitoring for pH and TRC are to be done prior to the discharge beginning and is not required while the discharge is occurring. If it is necessary to do more than one analysis for pH and/or TRC before the discharge begins, only the final analytical results are to be reported on the discharge monitoring report form. The analysis for TRC is to be done with an approved method that has a minimum detection level no greater than 0.100 mg/L (100 ug/L). For purposes of the permit, analytical values less than 0.10 mg/L are to be considered as zero and are to be reported as zero.

Part 1.3.2.2 has the self-monitoring requirements for Outfall 001 when there is an overflow of a settling basin(s). Grab samples are to be taken daily for TSS, pH, TRC, and oil and grease while there is an overflow of a settling basin and there is a discharge from Outfall 001. All

samples are to be taken at the end of the outfall pipe. Daily samples are being required because of the increase in potential for the effluent limitations being exceeded. The monitoring results for total volume discharged, TSS, pH, TRC, and oil and grease are to be summarized along with the other monitoring data from Parts 1.3.2.1 and reported on the discharge monitoring report for that reporting period. The total number of discharges that occurred while there was an overflow of a settling basin(s) shall be reported.

The reporting frequency is quarterly, with the reporting quarters based on the calendar quarter (e.g., January – March), etc.). More frequent reporting is not considered necessary for this discharge.

Inspection Requirements

The permit has some routine inspection requirements. Each day that water is being treated at the water treatment plant, the water level in each settling basin shall be determined to ensure that the settling basin is not likely to overflow before the next inspection. The purpose of this requirement is to minimize the potential of there being an overflow of a settling basin resulting in a discharge from Outfall 001.

The permit is also required to do monthly inspections of the sludge drying basins to check for the dykes for leaks, animal burrows, or excessive erosion. In addition, the settling basins are to be checked to see if there are any rooted plants, including weeds, growing in the sludge drying basins. The inspections shall be done at approximately 4 week intervals. Improper or inadequate operation and maintenance procedures should be noted. A notebook should be maintained to document all inspections as described above, and any actions recommended or taken at the facility to remedy any problems.

Miscellaneous

The permit effective date and expiration date will be determined at the time of permit issuance. The permit expiration date will be at the end of the calendar quarter closest to five years after the effective date, but not exceeding five years

Permit prepared by: Robert Shankland, SEE, Wastewater Unit (8P-W-WW), U.S. EPA, March 3, 2008.

Reviewed by: Bruce Kent, Wastewater Unit (8P-W-WW)

Addendum:

During the public notice period the snow had melted adequately to allow permittee to get to Outfall 002 and take accurate readings of the latitude and longitude. The following values were e-mailed to Bob Shankland: Latitude 37° 20' 27.15" N, Longitude 108° 24' 48.96". The permit and this statement of basis have been modified accordingly.

In a letter of April 3, 2008, the Office of Archaeology and Historic Preservation, Colorado Historical Society, recommended that EPA Region 8 initiate review of the proposed permit issuance with their office under Section 106 of the National Historic Preservation Act (Section 106). Detailed information about the location and nature of the discharge was e-mailed to their office. In a letter of April 15, 2008, the Office of Archaeology and Historic Preservation concurred that the renewal of the permit, a Federal undertaking under Section 106 of the National Historic Preservation Act (Section 106), would result in a finding of **no adverse effect** [36 CFR 800.5(b)] under Section 106.

No other comments were received. The State of Colorado gave 401 Certification in a letter of April 16, 2008.

The effective date of the permit will be May 19, 2008 and the expiration date will be March 31, 2013.

Robert D Shankland
SEE, EPA Region 8
May 19, 2008.